REMARKS

Claims 1-20 are currently pending in the subject patent application. Claims 1, 6, 13, and 17-20 have been amended to specify that the liquid for which the level is being measured has a surface in contact with a gas. No new matter has been added by these changes since support therefor may be found on page 11, lines 15-19 of the present Specification, as originally filed, wherein it is stated that: "When no liquid is present, sound propagates through the air (or vapor above a liquid surface) with difficulty because of the very high acoustic impedance mismatch between the solid wall and the gas. In principle, however, it is possible to observe resonances generated in the gas, but such signal levels are orders of magnitude smaller than those generated in a liquid when a liquid is present." Additionally, page 5, lines 21-25, of the present Specification, as originally filed, state: "Turning now to the drawings, FIG. 1 is a schematic representation of one embodiment of the apparatus of the present invention where standing waves are generated in an acoustic cavity formed by the surface of the liquid acting as a reflector and a transducer for introducing vibrational energy into the liquid external to and through a wall of the container holding the liquid." FIGURES 1, 4 and 6 of the present Specification, as originally filed, further contain support for the statement that the liquid surface is in contact with a gas.

In the subject Office Action, claims 13-15 and 20 were rejected under 35 U.S.C. 102(e) as being anticipated by Sinha (U.S. Patent Number 6,889,560), since the Examiner stated that with regard to claim 13, Sinha discloses a method for measuring liquid level in a container with comprises the steps of: (a) generating at least two acoustic resonances in the liquid substantially perpendicular to the surface of the liquid, and (b) determining the frequency of at least two acoustic resonances. These limitations are shown in view of Figures 1a through 1c and the disclosure in Col. 4 beginning at line 15 and ending in Col. 6 with line 17.

With regard to claim 14, the Examiner continued that the method for measuring liquid level in a container as described in claim 13, wherein the acoustic resonances are generated using a waveform comprising a sine wave is disclosed in Col. 4, lines 26-31; with regard to claim 15, the method for measuring liquid level in a container as described in claim 14, wherein the sine wave is swept over frequencies comprising at

least one acoustic wall resonance of a wall of the container perpendicular to the surface of the liquid is disclosed in Col. 6, lines 10 through 14; and with regard to claim 20, a method for measuring liquid level in a container with comprises the steps of (a) generating at least two acoustic resonances in the liquid substantially parallel to the surface of the liquid, and (b) detecting the presence of acoustic resonances from the liquid. These limitations are shown in view of Figures 1a through 1c and the disclosure in Col. 4, beginning at line 15 and ending in Col. 6 with line 17.

Applicants respectfully disagree with the Examiner concerning the rejection of claims 13-15 and 20 under 35 U.S.C. 102(e) as being anticipated by Sinha for the reasons to be set forth hereinbelow.

Claims 1-4, 6-11, and 17-19 were rejected under 35 U.S.C. 103(a) as being obvious over Sinha, since the Examiner stated that with regard to claims 1, 6 and 17-19, the basic limitations of the claims are disclosed in the Sinha reference in view of Figures 1a-1c and the disclosure, specifically, an apparatus for measuring liquid level in a container which comprises in combination: (a) a transducer in physical contact with the outside of a wall of the container for generating at least two acoustic resonance responses in the liquid substantially perpendicular to the surface (transducer 10a); (b) a sweep generator for electrically exciting said transducer over a chosen range of acoustical frequencies and having a chosen waveform (16, 20, and 26); and (c) a receiver for measuring the acoustic frequencies for at least two resonant responses (transducer 10b). The Examiner continued that whereas the independent apparatus claims are mere variations of the independent claim 1, and since claim 1 characterizes the overall breath of the claims, only that claim is used to describe the issues of the rejection. The Examiner stated further that these claims contain a similar limitation that is not specifically disclosed in the Sinha reference with regard to the placement of the transmitting transducer, whereby said transducer is to be located below the surface of the liquid. The Sinha reference has the transducer located above the liquid surface; however, the Examiner asserted that one of ordinary skill in the art would be able to simply place the transducer on the bottom of the vessel to be measured because the basic principle for operation established in the art is that the transducer signals are transmitted and reflected off a surface of the liquid level to be measured. Therefore, the

Examiner concluded that one skill in the art could arrange the transmitting transducer either above or below the liquid surface without altering the operation of the device, and therefore the mere rearrangement of the transducer location would not be considered novel in view of the Sinha reference. The Examiner continued that one would therefore be motivated to change the placement of the device, for example, for ease of replacement in an overhead pipe system in a building as the transducer being on the bottom would be easier to service or replace in the event of failure.

With regard to claims 2, 8 and 9, the Examiner stated that Sinha discloses in Col. 4, lines 15 through 30 the use of a swept sine wave generator; with regard to claims 3, and 10, Col. 5, lines 10 through 30 disclose the use of the fast Fourier Transform for analyzing the resonance responses; with regard to claims 4, and 11 the Examiner acknowledged that the Sinha reference discloses that it is preferred that a frequency range between wall resonances are used (see Col. 6, lines 5 through 30); however, this same section discloses the fact that any frequency range could be used, thus a frequency range including at least one acoustic wall resonance would be disclosed by Sinha; and with regard to claim 7, Figures 1a and 1b show an apparatus comprising an acoustic transmitter (10a) and an acoustic receiver (10b).

Applicants respectfully disagree with the Examiner concerning the rejection of claims 1-4, 6-11, and 17-19 under 35 U.S.C. 103(a) as being unpatentable over Sinha for the reasons to be set forth hereinbelow.

Turning now to the rejection of claims 13-15 and 20 under 35 U.S.C. 102(e) as being anticipated by Sinha, applicants wish to point out that Sinha teaches only the launching of acoustic waves perpendicular to the walls of a pipe completely filled with the liquid under investigation. See, for example, Col. 6, lines 50-53, where it is stated that: "The digitized data of two resonance peaks can then be used to extract the sound speed since the liquid path length (the diameter of the pipe) is known." Moreover, in Col. 9, lines 58-64, wherein it is stated that: "It is believed by the present inventor that the frequency shift is due to a slight variation in the acoustical properties of the fluid due to the flow boundary layer formed adjacent to the inner surface of the wall. This boundary layer tends to introduce a phase shift of the sound waves reflecting from the

wall which can affect the standing-wave pattern formed inside the total fluid path length."

Thus, the Sinha reference teaches that the fluid under investigation is in contact with the walls of the pipe between which a resonance response is generated. By contrast, subject claim 13, as amended by this Amendment A, recites generating at least two acoustic resonances in the liquid substantially perpendicular to the surface of the liquid, wherein the surface forms an interface with a gas. The observed resonances are generated between the wall of the container upon which a transducer is mounted and the surface of the liquid, as is clearly explained on page 11, lines 15-19 of the present Specification, as originally filed, wherein it is stated that: "When no liquid is present, sound propagates through the air (or vapor above a liquid surface) with difficulty because of the very high acoustic impedance mismatch between the solid wall and the gas. In principle, however, it is possible to observe resonances generated in the gas, but such signal levels are orders of magnitude smaller than those generated in a liquid when a liquid is present." Additionally, page 5, lines 21-25, of the present Specification, as originally filed, states: "Turning now to the drawings, FIG. 1 is a schematic representation of one embodiment of the apparatus of the present invention where standing waves are generated in an acoustic cavity formed by the surface of the liquid acting as a reflector and a transducer for introducing vibrational energy into the liquid external to and through a wall of the container holding the liquid." Thus, the observed resonances derive from a very different phenomenon in the present claimed invention from that of the Sinha reference.

Since claims 14 and 15 are dependent from independent claim 13, and applicants believe that claim 13 is patentable over the Sinha reference in view of the discussion hereinabove, no further discussion relative to these claims is deemed necessary.

Concerning claim 20, applicants wish to point out that the acoustic resonances are generated parallel to the surface of the liquid. Nowhere in Sinha are resonances taught or described that are generated parallel to the surface of the liquid under investigation.

Applicants respectfully disagree with the Examiner's rejection of claims 1-4, 6-11, and 17-19 under 35 U.S.C. 103(a) as being obvious over Sinha, since from claim 1, as amended, it is clear that the acoustic resonances are generated between the surface of the liquid and a wall located below the surface thereof. See, for example, the recitation of claim 1: "... a transducer in physical contact with the outside of a wall of the container located below the surface of the liquid for generating at least two acoustic resonance responses in the liquid substantially perpendicular to the surface; ... .", and page 5, lines 21-25, of the present Specification, as originally filed, wherein it is stated: "Turning now to the drawings, FIG. 1 is a schematic representation of one embodiment of the apparatus of the present invention where standing waves are generated in an acoustic cavity formed by the surface of the liquid acting as a reflector and a transducer for introducing vibrational energy into the liquid external to and through a wall of the container holding the liquid." Thus, applicants disagree with the Examiner's statement on page 5 of the subject Office Action that: "The Sinha reference has the transducer located above the liquid surface, however, one of ordinary skill in the art would be able to simply place the transducer on the bottom of the vessel to be measured because the basic principle for operation established in the art is that the transducer signals are transmitted and reflected off a surface of the liquid level to be measured.", in that Sinha does not teach reflection off a surface of the liquid level to be measured. Rather, as illustrated hereinabove, Sinha requires that the reflection is from the wall of the tube.

Nor would it be obvious from the teachings of Sinha that an acoustic resonant cavity could be formed in a liquid between the surface of a liquid having a gas interface and a metal wall below this surface.

The same discussion applies to subject claim 6, as amended. Since applicants believe that independent claims 1 and 6 are patentable over the Sinha reference, dependent claims 2-5 and 7-12, are patentable over Sinha, and no further discussion is deemed necessary with regard to these claims.

Claims 17-19 recite the generation of acoustic resonances in the liquid parallel to the surface thereof. As stated hereinabove in the discussion of subject claim 13, nowhere in Sinha is an acoustic resonance in the liquid taught or disclosed as being

parallel to the surface thereof. Nor, would such an acoustic resonance be obvious from the teachings of Sinha.

Thus, applicants respectfully believe that the Examiner has failed to make a *prima facie* case for obviousness as is required for a rejection under 35 U.S.C. 103(a) by using the Sinha reference.

In view of the discussion presented hereinabove, applicants believe that subject claims 1-20, as amended by this Amendment A, are in condition for allowance or appeal, the former action by the Examiner being earnestly solicited at an early date.

Reexamination and reconsideration are respectfully requested.

Respectfully submitted,

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